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## A case study: Self-efficacy beliefs of teacher candidates regarding developing educational software

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### Abstract

The purpose of this study is to analyze the self-efficacy beliefs of the teacher candidates towards developing educational software by some variables such as gender and grade and to investigate the correlation between self-efficacy beliefs and academic achievement. Sixty students participated to this study. Education Software Development Self-Efficacy Perception Scale was used as instrument. No significant difference was found between self-efficacy perceptions according to gender. Data analysis showed that fourth grade teacher candidates trust themselves more than third grade teacher candidates in terms of developing educational software. Also there was weak relationship between self-efficacy perception and academic achievement.

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*Keywords:* Self-efficacy; self-efficacy perception; educational software development; computer education and instructional technologies.

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### 1. Introduction

The concept of “Self-efficacy” is based on Bandura’s social cognitive theory. Bandura (1986, p. 391) defined self-efficacy as “People’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performance. Self-efficacy is concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses”. In other words, self-efficacy refers to self-assessment of individual ability to perform a specific behavior.

In recent years, researchers have become increasingly interested in the concept of self-efficacy. Many researchers use this concept in particular domains such as computer self-efficacy (Durndell, Haag, & Laithwaite, 2000; Aşkar & Umay, 2001; Shih, 2006; İşman & Çelikli, 2009), internet self-efficacy (Hsu & Chiu, 2004) and teacher self-efficacy (Tschannen-Moran, Hoy, & Hoy, 1998; Palmer, 2006). Researches argue that, although self-efficacy does not exactly reflect an individual’s abilities, it has an important role in arranging his/her behaviors. İşman & Çelikli (2009) state that researches discuss the attitudes toward computers as a part of computer self efficacy.

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There are a number of studies have pointed influence of teacher's self-efficacy beliefs on students' cognitive achievement and success at school (Kaufman and Sawyer, 2004; Caprara, Barbaranelli, Steca, & Malone, 2006; Savran Gencer & Çakıroğlu, 2007; Paraskeva, Bouta, & Papagianni, 2008). According to these studies, teachers with a high sense of efficacy are more willing to implement instructional innovations and competent teaching methods to be effective teacher, devote more time to teach and are most capable of activity-based teaching with regard to teachers with a low sense of efficacy. Consequently teacher's self-efficacy beliefs may influence a student's achievement in several ways.

One of the fields that could be studied is self-efficacy towards developing educational software. Educational software development is one of the major fields in Computer Education and Instructional Technologies Department. There are some courses in the curriculum related to this field. Self-efficacy towards developing educational software can be defined as an individual's belief regarding his/her possibility to develop and implement educational software (Aşkar & Dönmez, 2004; İmer & Özkılıç, 2009). This self-efficacy perception is important for a teacher candidate because it influences the goals that a teacher candidate set for himself/herself, the amount of effort he/or she will spend in order to achieve these goals, the exposure time that he/she will be able to spend to achieve his/her goals in case of difficulties or failures.

In a study by Paraskeva, Bouta, & Papagianni (2008) it is pointed out that teachers with a strong sense of self-efficacy are more open to new ideas and they are more willing to experiment with new methods at the same time offering students new and different learning opportunities or experiences. Consequently, teacher computer self-efficacy might determine to a considerable extent the ability to develop such technologies as an important educational tool.

As seen in previous paragraphs, literature indicates that a teacher's self-efficacy belief appears to be an important variable having influence both teaching activities and students' motivation and achievement. Many researchers have focused mostly on self-efficacy beliefs of teacher candidates towards computer usage, technology, internet, science and language learning but very few studies have been made on self-efficacy towards developing educational software. The aim of the present paper is to identify self-efficacy beliefs of teacher candidates in Computer Education and Instructional Technologies towards developing educational software and to investigate the relationship between their self-efficacy beliefs and their individual characteristics such as gender and grade. In order to achieve this purpose, research questions were constructed as follows:

- 1- Is there a significant difference between self-efficacy perception of teacher candidates towards developing educational software according to their gender?
- 2- Is there a significant difference between self-efficacy perception of teacher candidates towards developing educational software according to their grade?
- 3- Is there a relationship between self-efficacy perception of teacher candidates towards developing educational software and their general academic achievement?

## **2. Method**

The study was conducted during the spring semester of 2008-2009 academic year. This section includes participants, research model and data analysis procedure.

### *2.1. Participants*

Twenty nine in third grade and thirty one in fourth grade, a total of sixty students from Uludag University Faculty of Education CEIT Department participated to this study.

### *2.2. Research Model*

Descriptive research model was used in this study. One sample Kolmogorov-Smirnov test, independent samples t-test and correlation analysis was used to analyze the data collected from the teacher candidates.

### 2.3. Instrument

“Education Software Development Self-Efficacy Perception Scale” developed by Aşkar & Dönmez (2004) was administered as instrument. It is a five-point Likert-type scale and includes 22 items. The obtained score for each item ranged from 0 (I never trust) to 100 (I trust very much). The reliability coefficient of the scale was calculated as .92.

### 3. Results

In order to select the statistical analysis method, distribution of the data was examined by One Sample Kolmogorov-Smirnov test.

Table 1. One Sample Kolmogorov-Smirnov test results of average self-efficacy scores of teacher candidates

n	Mean	Sd	Z	p
60	66.12	17.57	1.004	.266

The test results shown in Table 1 indicate that the data distribution is normal ( $p > .05$ ). Therefore it was decided to use parametric test in order to analyze the data collected from teacher candidates.

#### 3.1. Findings Regarding First Research Question

First research question was “Is there a significant difference between self-efficacy perception of teacher candidates towards developing educational software according to their gender?” In order to answer this question independent samples t-test was used to compare mean self efficacy scores of male and female teacher candidates.

Table 2. Comparison of average self-efficacy scores of male and female teacher candidates

Groups	N	Mean	sd	t	P
Female	27	63.67	17.802	-0.977	.333
Male	33	68.12	17.392		

According to the test results shown in Table 2, there was no significant difference between male and female teacher candidates in term of self-efficacy beliefs regarding educational software development.

#### 3.2. Findings Regarding Second Research Question

Second research question was “Is there a significant difference between self-efficacy perception of teacher candidates towards developing educational software according to their grade?” In order to answer this question independent samples t-test was used to compare mean self-efficacy scores of third and fourth grade teacher candidates.

Table 2. Comparison of average self-efficacy scores of third and fourth grade teacher candidates

Groups	N	Mean	sd	t	p
Third Grade	29	56.59	17.352	-4.748	.000
Fourth Grade	31	75.03	12.497		

According to the test results shown in Table 2, there was significant difference between third and fourth grade teacher candidates in term of self-efficacy beliefs regarding educational software development. The difference is in favour of fourth grade teacher candidates. To state the matter differently, fourth grade teacher candidates trust themselves more than third grade teacher candidates in terms of developing educational software.

### 3.3. Findings Regarding Third Research Question

Third research question was “Is there a relationship between self-efficacy perception of teacher candidates towards developing educational software and their general academic achievement?” In order to answer this question Pearson correlation coefficient was calculated and it was found as 0.174 for those variables.

## 4. Discussion

In this study the self-efficacy beliefs of the teacher candidates at the CEIT department towards developing educational software were investigated according to their demographic data (gender and grade) and the correlation between students' self-efficacy and their general academic achievement was analyzed. According to the data analysis, it can be concluded that the self-efficacy beliefs of the teacher candidates at the CEIT department towards developing educational software were over the medium level (Mean score=66.12,  $n=60$ ). Literature states that teachers with a high sense of efficacy are more willing to implement instructional innovations and competent teaching methods to be effective teacher, devote more time to teach and are most capable of activity-based teaching with regard to teachers with a low sense of efficacy. Consequently teacher's self-efficacy beliefs may influence a student's achievement in several ways (Kaufman and Sawyer, 2004; Caprara, Barbaranelli, Steca, & Malone, 2006; Savran Gencer & Çakıroğlu, 2007; Paraskeva, Bouta, & Papagianni, 2008). In this respect effective teaching strategies must be considered for the lessons related to developing educational software in the curriculum. Bandura (2006) stated that students are likely to develop high perceived self-efficacy in dissimilar academic subjects in superior schools, but similarly low perceived efficacy in ineffective schools. In this respect every attempt to improve teacher education programs such as improving teaching learning activities, improving collaboration among schools and the education faculties and providing enough practice opportunities to students will help to increase the self-efficacy perception of teacher candidates.

According to the data analysis, no significant difference was found between male and female teacher candidates in terms of self-efficacy beliefs regarding educational software development ( $n_{\text{Female}}=27$ ,  $n_{\text{male}}=33$ ,  $p=.333$ ). In some studies (Miura, 1987; İmer & Özkılıç, 2009) gender differences were found in favour of male students as inconsistent of this study. On the other hand Murpy, Coover and Owen (1989) determined that there was no significant difference among male and female students in terms of computer self-efficacy. It must be noted that the sample of the stated studies consisted of the students from different departments and from different universities. But the participants of this study were only from CEIT department at Uludag University and the sample size was small.

In addition to the findings discussed above, significant difference was found between third and fourth grade teacher candidates in term of self-efficacy beliefs regarding educational software development ( $n_{\text{Third Grade}}=29$ ,  $n_{\text{Fourth Grade}}=31$ ,  $p=.000$ ). The difference was in favour of fourth grade teacher candidates. It can be concluded that fourth grade teacher candidates trust themselves more than third grade teacher candidates in terms of developing educational software. This result was expected because third grade students haven't completed some of the lessons related to developing educational software yet.

The last finding was about the correlation between self-efficacy beliefs and general academic achievement of teacher candidates. According to the data analysis it can be concluded that there was weak relationship between self-efficacy perception of teacher candidates and their general academic achievement ( $r=.174$ ).

This study investigated teacher candidates' self efficacy beliefs considering their total score of the scale. The scale was developed to measure four dimensions of the education software development process. These dimensions are project management and instructional design, graphic design, programming, animation and sound-video design. These dimensions should be taken into account in the future studies. In addition, further research should be done focusing on the relationship between self efficacy beliefs of teacher candidates and their achievement in some lessons in the curriculum related to developing educational software.

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